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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,073	07/19/2006	Andreas Orth	20941/0211431-US0	2660

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EXAMINER	
SINGH, PREM C	

ART UNIT	PAPER NUMBER
1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,073	ORTH ET AL.	
	Examiner	Art Unit	
	PREM C. SINGH	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/09/09; 07/13/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Amendment to claim 1 and new drawings are noted.

2. New ground of rejection necessitated by claim amendment follows.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-10 and 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beisswenger et al (US Patent 4,716,856) in view of Lapple et al (US Patent 3,578,798).

5. With respect to claims 1-4, Beisswenger discloses a method of producing solids (solids should necessarily be comprising low temperature coke) (See column 8, lines 20-21) in which granular coal is heated to a temperature of 400 to 1200°C in a fluidized bed reactor (See column 2, lines 30-34; column 4, lines 37-39) by an oxygen-containing gas comprising introducing from below a first gas or gas mixture through at least one gas supply tube into a mixing chamber of the fluidized bed reactor (See figure 1 and column 2, lines 33-34; column 5, lines 30-32). Beisswenger further discloses that when particle Froude number is used to define the operating conditions, the following ranges can be determined (See column 2, lines 48-50):

$0.1 \leq (¾)\ (Fr)^2(\rho_g/[\rho_k - \rho_g]) \leq 10$ (See column 2, lines 51-69).

Beisswenger invention does not specifically disclose the gas supply tube surrounded by a stationary annular fluidized bed. Beisswenger does not appear to specifically disclose entrainment of solids from the stationary annular fluidized bed.

Lapple discloses an improvement in a fluidized bed reactor by providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See column 1, lines 22-29). Lapple also discloses that this arrangement causes increased capability for reaction or heat transfer effects in the fluidized bed (See column 1, lines 35-44). Lapple further discloses entraining of solids from the stationary annular fluidized bed into mixing chamber when passing through the central tube (See column 1, lines 35-40).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention and improve the design of the reactor by an arrangement as disclosed by Lapple for an enhanced reaction rate and heat transfer.

It is to be noted that in Lapple's central tube [14] the entrained solids will ultimately be dispersed from the top of end [16]. Thus, in a continuous, steady operation the level of the bed [17] is expected to rise and will be flushed with the end of the tube [16]. Thus, it is expected that in Lapple invention also the solids will be entrained from the stationary annular fluidized bed extending beyond the upper end of the central tube upon the gas passing through the end of the tube, similar to the Applicant's claim.

It is to be noted that Beisswenger invention gives a range of Froude number to define the "operating conditions" (See column 2, line 49). Obviously, the range should necessarily be applicable in the gas supply tube, stationary annular fluidized bed

(formed due to the modification in the apparatus according to Lapple's disclosure) and in the mixing chamber, as claimed.

6. With respect to claim 5, Beisswenger discloses that solids are discharged from the fluidized bed reactor and separated in a separator and a part of the solids is recirculated to the stationary fluidized bed (See column 3, lines 6-10; column 7, lines 60-62; column 11, lines 22-26).

7. With respect to claim 6, Beisswenger discloses that amount of product stream recirculated to the stationary annular fluidized bed is controlled (See column 7, lines 34-40). Although Beisswenger invention does not specifically disclose control by difference in pressure, it would have been obvious to one skilled in the art to use any suitable method to control the amount of solids, including the pressure differential above the mixing chamber, as claimed.

8. With respect to claims 7 and 8, Beisswenger discloses that coal particles (lignite) less than 3/8 inch (9.5 mm) are used in the fluidized bed reactor as a starting material (See column 11, lines 5-10). Lignite is known to those skilled in the art as a highly volatile coal.

9. With respect to claims 9 and 10, Beisswenger discloses that the fluidizing gas supplied to the fluidized bed reactor is an oxygen-rich air supplied under super

atmospheric pressure, preferably up to 20 kg/cm^2 above atmospheric pressure (See column 6, lines 27-33).

10. With respect to claims 14-16, Beisswenger discloses a plant for producing solids (should necessarily be comprising low temperature coke) (See column 8, lines 20-21) by the method as discussed under claim 1, comprising a fluidized bed reactor with a gas supply tube, wherein the gas supply tube entrains solids from a fluidized bed (See figure 1 and column 12, lines 29-56).

Beisswenger invention does not specifically disclose an annular fluidized bed which surrounds the gas supply tube.

Lapple discloses an improved fluidized bed reactor by providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See column 1, lines 22-29). Lapple also discloses that this arrangement causes increased capability for reaction or heat transfer effects in the fluidized bed (See column 1, lines 35-44). Lapple further discloses entraining of solids from the stationary annular fluidized bed into mixing chamber when passing through the central tube (See column 1, lines 35-40). Lapple shows a mixing chamber located above the upper end of the gas supply tube (See figure 1).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention and improve the plant design by a central tube arrangement as disclosed by Lapple for an enhanced reaction rate and heat transfer. This arrangement will provide an annular fluidized bed surrounding the gas supply tube,

wherein the gas supply tube is centrally located with reference to the cross sectional area of the fluidized bed reactor (See Beisswenger: figure 1 and Lapple: figure 1) and wherein the gas flowing through the gas supply tube entrains solids from the stationary annular fluidized bed into the mixing chamber when passing through the upper nozzle region of the gas supply tube (See See Beisswenger: figure 1; column 7, lines 17-20, 24-26; column 12, lines 29-56 and Lapple: figure 1). It is to be noted that Beisswenger uses a nozzle which is functionally similar to the claimed orifice region.

11. With respect to claim 17, Beisswenger discloses a separator (20, 24) downstream of the fluidized bed reactor of the plant for separating solids which has a solids return conduit (28) leading to the fluidized bed reactor (18) (See figure 1).

12. With respect to claim 18, Lapple discloses that in the annular chamber (16) of the fluidized bed reactor (10) a gas distributor (31) is provided which divides the annular chamber into an upper fluidized bed region (17) and a lower gas distribution chamber (30) and the gas distributor chamber is connected with a supply conduit (32) for fluidizing gas (See figure 1).

13. With respect to claim 19, Beisswenger discloses, “An air preheater can also be employed to partially recover the heat contained in the flue gas” (Column 7, lines 57-59). Obviously, Beisswenger is suggesting to use a heat preheater (upstream of the fluidized bed reactor). Thus, it would have been obvious to one skilled in the art at the

time of invention to modify Beisswenger invention by using a heat exchanger upstream of the fluidized bed reactor to preheat the fluidizing air by hot flue gases and make the plant more economical. It is also to be noted that flue gases contain some fine coal particles not separated in the cyclone separator (20, 24) (See column 7, lines 51-57). Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention by using a separator to further clean the flue gas coming out from the heat exchanger before exhausting to atmosphere.

14. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beisswenger et al (US Patent 4,716,856) in view of Lapple et al (US Patent 3,578,798) and further in view of Bresser et al (US Patent 5,560,762).

15. With respect to claims 11-13, Beisswenger discloses use of all kinds of coal, washery refuse, various industrial residues, wood wastes and municipal refuse (See column 6, lines 39-43), however, the invention does not appear to specifically disclose use of iron ore.

Bresser discloses a process of heat treatment of iron ore in granular form in a fluidized bed reactor under temperature and pressure conditions similar to Beisswenger invention (See column 1, lines 34-50; column 2, lines 15-49; column 7, lines 5-21). Bresser also discloses that particle Froude number for the process is also in a range similar to Beisswenger (See column 3, lines 1-24). Bresser further discloses that all

coals, carbon containing minerals, washery refuse etc. may be used as carbon containing material (See column 7, lines 5-8).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Beisswenger invention and blend iron ore with the coal feed in the fluidized bed reactor and produce coke as well as heat treated iron ore in the same plant and make the process more flexible and useful. It would also have been obvious to specify the weight ratio of iron to carbon in the product for proper characterization of the products produced in the fluidized bed reactor.

Response to Arguments

16. Applicant's arguments filed 10/07/2009 have been fully considered but they are not persuasive.

17. In the arguments on page 11/16 and page 12/16 (paragraph 1), the Applicant argues that neither Beisswenger nor Lapple teach or suggest least one gas supply tube being at least partly surrounded by a stationary annular fluidized bed extending beyond the upper orifice, with the solids being entrained from the stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through an upper orifice region as now recited in claim 1. Lapple does not cure this defect. In contrast, Lapple describes a fluidized bed construction with a central tube 14 "above the normal level of the fluidized bed" and not a "stationary annular fluidized bed

extending beyond the upper orifice" as recited in claim 1. See Lapple, column 1, lines 26-30 and Fig. 1. Lapple furthermore does not entrain solids from a stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through the upper orifice region as is recited in claim 1. In contrast, Lapple describes a system where the central tube 14 has passageways through which particles are introduced into the central tube 14. See Lapple, Fig. 2. Fig. 1 of Lapple also clearly shows that the particles are ejected from tangentially arranged passages 36 into the central portion of tube 14. As per Fig. 1, this occurs towards the middle section of tube 14 and not at an upper orifice region as is recited by claim 1. Moreover, the design of Lapple makes it impossible to entrain solids from a stationary annular fluidized bed extending beyond any upper orifice of the tube 14 because, as already stated above, the tube 14 of Lapple extends beyond the level of the fluidized bed.

The Applicant's argument is not persuasive because as discussed in the Office action above, Lapple discloses providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed (See figure 1; column 1, lines 22-29). Lapple further discloses entraining of solids from the stationary annular fluidized bed into mixing chamber when passing through the central tube (See column 1, lines 35-40). It is to be noted that in Lapple's central tube [14] the entrained solids will ultimately be dispersed from the top of end [16]. Thus, in a continuous, steady operation the level of the bed [17] is expected to rise and will be flushed with the end of the tube [16]. Thus, it is expected that in Lapple invention also the solids will be entrained from the stationary annular fluidized bed extending beyond

the upper end of the central tube upon the gas passing through the end of the tube, similar to the Applicant's claim.

18. In the arguments on page 12/16 (paragraph 2-3), the Applicant argues that neither Beisswenger nor Lapple teach or suggest adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30., as recited in claim 1. In contrast, Beisswenger merely describes a typical Froude number range for a circulating fluidized bed reactor that may define overall reactor operating conditions. Beisswenger nowhere teaches establishing differing Froude ranges in different portions of the chamber of an annular fluidized bed reactor, i.e., the gas supply line, annular fluidized bed and mixing chamber, as recited in claim 1. Nor therefore does Beisswenger teach the combination of Froude number ranges recited in claim 1. Regarding Lapple, that reference does not teach Froude numbers at all. Lapple moreover recites an annular reactor. A person of ordinary skill in the art would therefore not have attempted to apply the Froude numbers of Beisswenger relating to circulating fluidized bed reactor to control the annular fluidized bed reactor of Lapple. Because each of Beisswenger and Lapple are missing at least the aforementioned features recited in claim 1, it is respectfully submitted that any combination of Beisswenger and Lapple, to the extent proper, could not render claim 1 or any of its dependent claims obvious. Nor does Bresser cure the deficiencies of a

combination of Beisswenger and Lapple. Therefore, a combination of Beisswenger in view of Lapple and further in view of Bresser, to the extent proper, could not render dependent claims 11-13 obvious.

The Applicant's argument is not persuasive because Beisswenger discloses, "When Froude number and Archimedes number are used to define the operating conditions, the following ranges can be determined……. (Column 2, lines 48-69). It is to be noted that "operating conditions" encompass the operation of gas supply tube, the stationary annular fluidized bed and the mixing chamber. Thus, Beisswenger invention modified by Lapple is expected to be controlling the operating conditions in the gas supply tube [14], the stationary annular fluidized bed [17] and the mixing chamber [37] using the Froude number in a proper range, including as claimed.

19. In conclusion, the claimed invention is *prima facie* obvious over Beisswenger in view of Lapple and Bresser.

Conclusion

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PREM C. SINGH whose telephone number is (571)272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PS 010309

/In Suk Bullock/
Primary Examiner, Art Unit 1797